WHAT IS CLAIMED IS:

1. An off-axis beam shaper for producing an output beam of a desired order with a desired energy distribution, comprising:

an optical substrate; and

a diffractive surface formed on the optical substrate to perform both a beam shaping function on an input beam and to spatially separate the output beam of the desired order from all other diffracted beams of different orders, thereby avoiding interference between the output beam and any other diffracted beam of a different order.

2. The beam shaper of claim 1, wherein the beam shaping function includes changing an energy distribution of the input beam from Gaussian to uniform.

3. The beam shaper of claim 1, further comprising:

a beam corrector located a distance from the beam shaper to correct a phase of the output beam.

4. The beam shaper of claim 3, wherein the beam corrector changes a direction of the output beam.

5. The beam shaper of claim 1, wherein the diffractive surface deflects the output beam at an acute angle to an optical axis of the input beam.

6. The beam shaper of claim 1, wherein the desired order is 1st order.

7. An off-axis beam splitter for producing a plurality of substantially identical output beams, comprising:

an optical substrate; and

a diffractive surface formed on the optical substrate to split an input beam into the plurality of substantially identical output beams and to translate the plurality of output beams away from an optical axis of the input beam.

8. The beam splitter of claim 7, wherein the plurality of output beams fall along a first line, and the first line of output beams is translated a sufficient distance from the optical axis of the input beam in a direction substantially perpendicular to the first line to avoid interference with diffracted beams along a second line intersecting the optical axis of the input beam.

9. The beam splitter of claim 8, wherein none of the plurality of output beams overlaps a 0th order beam output from the splitter.

10. The beam splitter of claim 7, wherein the plurality of output beams define a two dimensional array, and the array of output beams are translated a sufficient distance from the optical axis of the input beam in a direction perpendicular to the optical axis to avoid interference with lower order diffracted beams centered about the optical axis of the input beam.

11. A method of shaping an input beam with diffractive optics, comprising:

diffracting an input beam to have a desired shape and energy distribution at a predetermined distance from the optic; and

spatially separating an output beam having a desired order from other diffracted beams of different orders at the predetermined distance.

12. The method of claim 11, wherein the diffracting step includes

changing an energy distribution of the input beam from Gaussian to uniform.

13. The beam shaper of claim 11, further comprising:

correcting a phase of the output beam.

14. The beam shaper of claim 13, wherein the correcting step includes changing a direction of the output beam.

15. The beam shaper of claim 11, wherein the spatially separating step includes deflecting the output beam at an acute angle to an optical axis of the input beam.

16. A method for producing a plurality of substantially identical and uniform output light beams, comprising:

splitting an input beam into the plurality of substantially identical output beams; and

translating the plurality of output beams away from an optical axis of the input beam.

17. The method of claim 16, wherein the splitting step includes

splitting the input beam into output beams which fall along a line; and wherein the translating step includes

translating the line of output beams up or down one order from the optical axis of the input beam in a direction substantially perpendicular to the line so that none of the plurality of output beams overlaps a 0th order beam output from the splitter.

18. The method of claim 16, wherein the splitting step includes

splitting the input beam into output beams which constitute a two dimensional array; and wherein the translating step includes

translating the array of output beams a sufficient number of orders from the optical axis of the input beam in a direction perpendicular to the optical axis to avoid interference with lower order diffracted beams centered about the optical axis of the input beam.